480591

FLOOD INSURANCE STUDY

NEWARK PUBLIC LIBRARY

FEB 3 1981

U. S. GOVT. PUBS.
DEPOSITORY 376

CITY OF CROWLEY, TEXAS
TARRANT COUNTY

best copy available

OCTOBER 15, 1980

federal emergency management agency
federal insurance administration

COMMUNITY NUMBER - 480591

FEM 1.209:

TABLE OF CONTENTS

		Page
1.0	INTRODUCTION	1
	1.1 Purpose of Study	1
	1.2 Authority and Acknowledgments	1
	1.3 Coordination	1
2.0	AREA STUDIED	2
	2.1 Scope of Study	2
	2.2 Community Description	2
	2.3 Principal Flood Problems	4
	2.4 Flood Protection Measures	4
3.0	ENGINEERING METHODS	4
	3.1 Hydrologic Analyses	5
	3.2 Hydraulic Analyses	6
4.0	FLOOD PLAIN MANAGEMENT APPLICATIONS	7
	4.1 Flood Boundaries	7
	4.2 Floodways	8
5.0	INSURANCE APPLICATION	12
	5.1 Reach Determinations	12
	5.2 Flood Hazard Factors	13
	5.3 Flood Insurance Zones	13
	5.4 Flood Insurance Rate Map Description	14

TABLE OF CONTENTS - continued

		Page
6.0	OTHER STUDIES	14
7.0	LOCATION OF DATA	17
8.0	BIBLIOGRAPHY AND REFERENCES	17

FIGURES

Figure 1 - Vicinity Map 3

Figure 2 - Floodway Schematic 12

TABLES

Table 1 - Summary of Discharges 5

Table 2 - Floodway Data 9-11

Table 3 - Flood Insurance Zone Data 15-16

EXHIBITS

Exhibit 1 - Flood Profiles

Deer Creek	Panels 01P-04P
Northwest Branch of Deer Creek	Panels 05P-08P
North Branch of Deer Creek	Panels 09P-11P
South Fork of North Branch of Deer Creek	Panels 12P-14P
South Fork of Deer Creek	Panels 15P-16P

Exhibit 2 - Floodway Boundary and Floodway Map

PUBLISHED SEPARATELY

Flood Insurance Rate Map

FLOOD INSURANCE STUDY
CITY OF CROWLEY, TEXAS

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the City of Crowley, Tarrant County, Texas, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study will be used to convert the City of Crowley to the regular program of flood insurance by the Federal Insurance Administration (FIA). Local and regional planners will use this study in their efforts to promote sound flood plain management.

In some states or communities, flood plain management criteria or regulations may exist that are more restrictive or comprehensive than those on which these Federally-supported studies are based. These criteria take precedence over the minimum Federal criteria for purposes of regulating development in the flood plain, as set forth in the Code of Federal Regulations at 24 CFR, 1910.1 (d). In such cases, however, it shall be understood that the state (or other jurisdictional agency) shall be able to explain these requirements and criteria.

1.2 Authority and Acknowledgments

The source of authority for this Flood Insurance Study is the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were performed by U.S. Army Corps of Engineers, Fort Worth District, for the Federal Insurance Administration, under Interagency agreement No. (IAA) - H - 18-78, Project Order No. 44. This study was completed in October 1979.

1.3 Coordination

Community base map selection and the identification of streams requiring detailed study were done during the initial coordination meeting held on October 18, 1978, attended by the City secretary, the Community Coordination Officer (CCO), and U.S. Army Corps of Engineers (COE) representative. The Soil Conservation Service (SCS), the US Geological Survey (USGS), the State Department of Highways and Public Transportation, and the Texas Department of Water Resources were contacted for information related to the study.

A final coordination meeting was held on March 8, 1980, in the City of Crowley at which time the results of this study were reviewed with community officials, COE and FIA officials were represented at this meeting.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the City of Crowley. The area of study is shown on the Vicinity Map (Figure 1).

Detailed hydrologic and hydraulic studies were made on Deer Creek and its tributaries.

The areas studied by detailed methods were selected with priority given to all known flood hazard areas, and areas of projected development or proposed construction for the next five years, through October 1984.

Approximate analyses were used to study those areas having a low development potential or minimal flood hazards. The scope and methods of study were proposed to and agreed upon by FIA, and the City of Crowley.

2.2 Community Description

Crowley is located in north central Texas in the southern portion of Tarrant County. The total land area within the city is about 8.5 square miles, and it is situated about 12 miles south of downtown Fort Worth. Crowley is bounded by the City of Fort Worth on the north and east, the City of Burleson on the south, and the unincorporated areas of Tarrant County on the west. The Texas Municipal League lists the estimated 1976 population as 5,000. Deer Creek and its tributaries flow in a generally easterly direction through the city.

Crowley is primarily a residential community with most of the current development located in the central part of the city. At the present time, little development exists in the flood plains depicted in this report.

The topography is gently rolling to almost level, with elevations in the community varying from about 850 to 680. The soils in the area are generally deep and clayey with underlying limestone. The native vegetation in the undeveloped areas consists of bunch and short grasses with scattered mesquite trees.

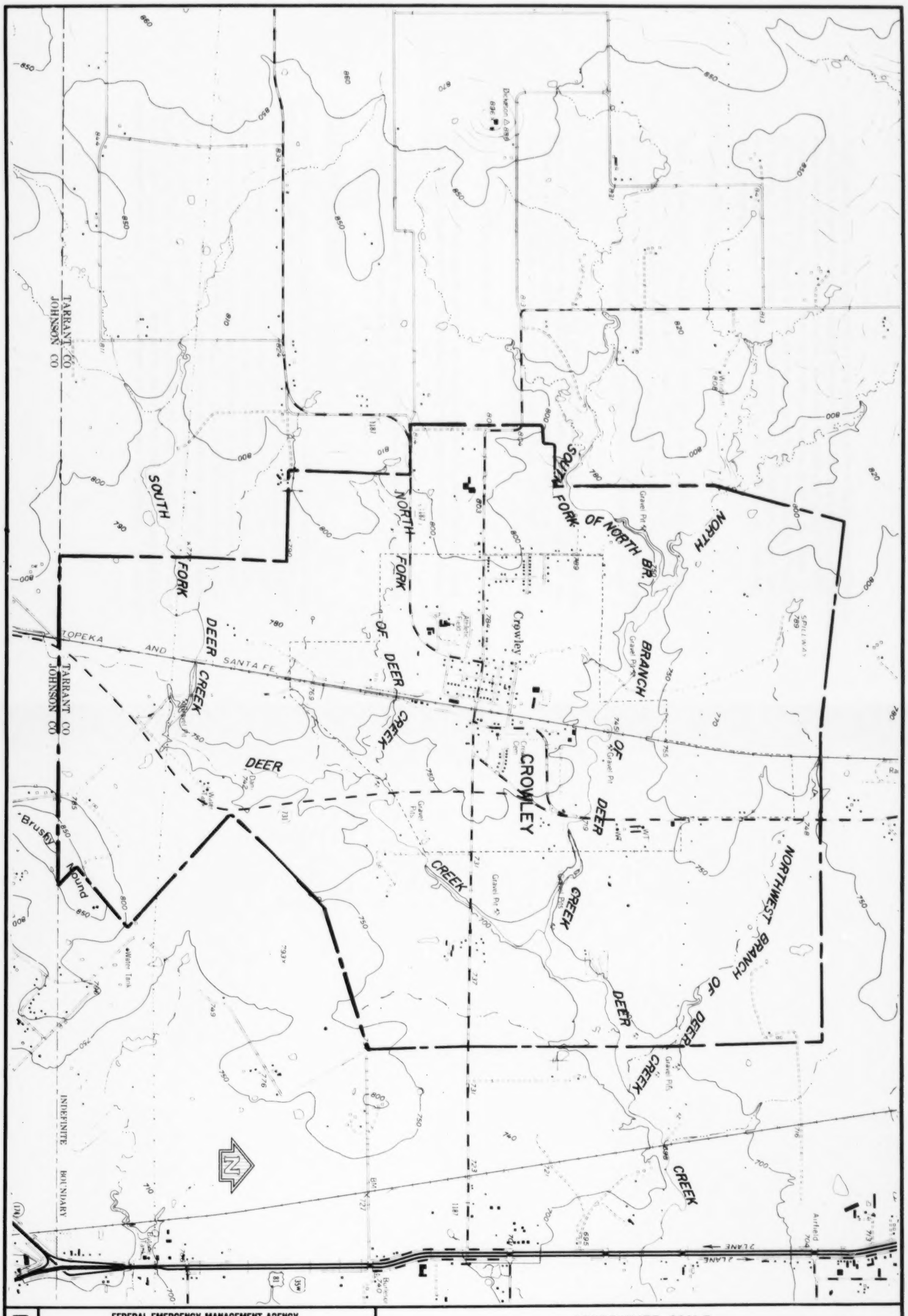


FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF CROWLEY, TX
(TARRANT CO.)

APPROXIMATE SCALE
0 2000 4000 6000 8000 FEET

VICINITY MAP

The Crowley area has a generally mild climate with a large range of annual and daily temperatures. Freezing temperatures and snowfall are occasionally experienced during winter months. Summer temperatures are hot with moderately warm nights. The mean annual temperature in the area is about 66 degrees F. Extremes in temperature range from a minimum of minus 8 degrees F to a maximum of 112 degrees F. The mean annual precipitation at Fort Worth, based on combined records for city and airport stations, is 31.33 inches.

2.3 Principal Flood Problems.

Most of the flood producing storms that occur in the Crowley area are experienced in the spring and fall. Most of the higher floods that have occurred in the general geographical region have resulted from prolonged or successive storms that produce heavy rainfall during this period; however, severe flooding can be produced by intense local thunderstorms at any time.

Due to the small size and rural nature of the Deer Creek watershed, little specific data are available regarding past floods. Data available for the Village Creek watershed (Reference 1), of which Deer Creek is a part, indicate major floods occurred in 1922, 1949, 1957, and 1969. Flooding probably occurred on Deer Creek during these periods.

2.4 Flood Protection Measures

Several short reaches of stream straightening and/or enlargement have taken place in connection with subdivision development and road construction.

The City of Crowley is currently controlling flood plain development by means of a permit system.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude which are expected to be equalled or exceeded once on the average during any 10-, 50-, 100-, and 500-year period (recurrence intervals), have been selected as having special significance for flood plain management and for flood insurance premium rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10, 2, 1, and 0.2 percent chance, respectively, of being equalled or exceeded during any year. Although the recurrence interval represents the long term, average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than one year are considered. For example,

the risk of having a flood which equals or exceeds the 100-year flood (one percent chance of annual occurrence) in any 50 year period is about 40 percent (four in 10), and for any 90 year period, the risk increases to about 60 percent (six in 10). The analyses reported here reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish peak discharge-frequency relationships for floods of the selected recurrence intervals for each flooding source studied in detail in the community.

Discharge used in this report were taken directly from the Deer Creek and Tributaries Flood Plain Information Report (Reference 1). The following methods were used to develope the peak discharges for that report.

Each of the streams studied in detail were divided into subareas, and synthetic unit and flood hydrographs were developed at selected locations. National Weather Service Technical Paper Number 40 (Reference 2) was used in developing the 10-, 50-, and 100-year storms. The 500-year storm was based on extrapolated data. Frequency peak discharges at selected locations were computed. Additionally, numerous headwater areas of less than 2 square miles were modeled using the rational method, where Q=CIA. The variables in this method are defined as follows: Q is the peak discharge in cubic feet per second (cfs), C is a runoff coefficient, I is the rainfall intensity in inches per hour for the watershed time of concentration, and A is the drainage area in acres. The decrease in peak discharge with an increase in drainage area for some streams is due to watershed shape and/or overbank storage effects.

The peak discharge-drainage area relationships for the selected recurrence intervals are presented in Table 1, "Summary of Discharges."

TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
DEER CREEK					
Below Northwest Branch	16.86	13,500	19,000	21,500	27,500
Above Northwest Branch	15.23	12,500	17,600	19,800	25,300
Below North Branch	14.31	13,000	18,200	20,500	26,100
Above North Branch	8.28	7,400	10,300	11,600	14,800
Above Farm Road 731	7.54	7,900	10,900	12,200	15,500
Below North Fork	7.16	7,000	9,700	10,900	13,900
Above North Fork	6.38	6,500	9,100	10,200	12,900
Below South Fork	5.45	6,400	8,900	10,000	12,600
Above South Fork	1.13	1,700	2,300	2,600	3,250
Above Tarrant County Line	0.91	1,400	1,900	2,100	2,550

TABLE 1 - SUMMARY OF DISCHARGES - cont.

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
NORTHWEST BRANCH OF DEER CREEK					
Confluence with Deer Creek	1.63	2,350	3,200	3,600	4,500
NORTH BRANCH OF DEER CREEK					
Confluence with Deer Creek	6.09	6,000	8,400	9,400	12,000
Above Atchison Topeka and Santa Fe Railway	5.53	6,300	8,700	9,800	12,400
Below South Fork of North Branch	4.80	6,400	8,900	9,900	12,500
Above South Fork of North Branch	1.98	2,800	3,900	4,350	5,500
SOUTH FORK OF NORTH BRANCH Of Deer Creek					
Confluence with North Branch	2.82	3,750	5,100	5,700	7,200
SOUTH FORK OF DEER CREEK					
Confluence with Deer Creek	4.32	5,100	7,000	7,800	9,900
Below North Tributary of South Fork	4.19	5,400	7,400	8,300	10,500
Above North Tributary of South Fork	3.61	4,600	6,300	7,100	9,000

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of the flooding sources studied in detail in the community were carried out to provide estimates of the elevations of floods of the selected recurrence intervals along each of the flood sources.

Cross sections data for the streams in the study area were obtained by field survey. All bridges and culverts were field surveyed to obtain elevation data and structural geometry. Cross sections were located at close intervals upstream and downstream of bridges and culverts in order to compute significant backwater effects of these structures. The locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway is computed (Section 4.2), selected cross section locations are also shown on the Flood Boundary and Floodway Map (Exhibit 2).

Roughness coefficients (Manning's "n") for the computations were estimated on the basis of field inspection of flood plain areas. The roughness coefficients ranged from 0.015 to 0.060 for the main channel and 0.060 to 0.100 for the overbank areas.

Flood profiles were drawn showing computed water-surface elevations to an accuracy of 0.5 foot for floods of the selected recurrence intervals (Exhibit 1). Water-surface elevations of floods of the selected recurrence intervals were developed using the COE HEC-2 step-backwater computer program (Reference 3). The flood profiles for each of the streams studied in detail were compared to previous studies for verification of results (Reference 1).

The starting water-surface elevations were obtained by slope area determinations.

All elevations used in this study are referenced to National Geodetic Vertical Datum of 1929 (NGVD); the elevation reference marks used in this study are shown and described on the maps.

Flood boundaries for some streams with drainage areas of less than on square mile (approximate areas) were delineated from data contained in the Deer Creek and Tributaries, Crowley, Texas Flood Plain Information Report (Reference 1).

Flood elevations in the City of Crowley may be raised by debris blockage of the streams in the study area. The hydraulic analyses for this study, however, are based only on the effect of unobstructed flow. The flood elevations as shown on the profiles are this considered valid only if hydraulic structures in general remain unobstructed and do not fail.

4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

The National Flood Insurance Program encourages state and local governments to adopt sound flood plain management programs. Therefore, each Flood Insurance Study includes a flood boundary map designed to assist communities in developing sound flood plain management measures.

4.1 Flood Boundaries

In order to provide a national standard without regional discrimination, the 100-year flood has been adopted by the FIA as the base flood for purposes of flood plain management measures. The 500-year flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the boundaries of the 100- and the 500-year floods have been delineated using the flood elevations determined at each cross section; between cross sections, the boundaries were extrapolated using the available topographic map with a contour interval of 10 feet (Reference 4). In cases where the 100 and the 500-year flood boundaries are close together, only the 100-year boundary has been shown.

Small areas within the flood boundaries may lie above the flood elevations and therefore not be subject to flooding; owing to limitations of the map scale, such areas are not shown.

To assist users of the flood insurance report data in locating the actual boundaries of the base flood or for determining the elevation of specific sites or structures in relation to the base flood, elevation references marks are shown and described on the maps. These reference marks were established by the COE in connection with the Deer Creek and Tributaries Flood Plain Information Report.

4.2 Floodways

Encroachment on flood plains, such as artificial fill, reduces the flood-carrying capacity, increases the flood heights of streams, and increases flood hazards in areas beyond the encroachment itself. One aspect of flood plain management involves balancing the economic gain from flood plain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, the concept of a floodway is used as a tool to assist local communities in this aspect of flood plain management. Under this concept, the area of the 100-year flood is divided into a floodway and a floodway fringe. The floodway is the channel of a stream plus any adjacent flood plain areas that must be kept free of encroachment in order that the 100-year flood may be carried without substantial increases in flood heights. Minimum standards of the FIA limit such increases in flood heights to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this report are presented to local agencies as minimum standards that can be adopted or that can be used as a basis for additional studies.

The floodway proposed for this study was computed on the basis of equal conveyance reduction from each side of the flood plain. The results of these computations are tabulated at selected field cross sections for each stream segment for which a floodway is computed (Table 2). As shown on the Flood Boundary and Floodway Map (Exhibit 2), the floodway boundaries were determined at cross sections; between cross sections the boundaries were extrapolated.

The area between the floodway and the boundary of the 100-year flood is termed the floodway fringe. The floodway fringe thus encompasses the portion of the flood plain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to flood plain development are shown in Figure 2.

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Deer Creek								
A	21,920	324	2,162	9.16	690.3	690.3	690.5	0.2
B	23,030	341	3,349	5.91	694.5	694.5	695.3	0.8
C	24,620	349	2,787	7.36	698.1	698.1	698.9	0.8
D	25,400	347	2,163	9.48	701.8	701.8	702.3	0.5
E	26,450	375	2,942	3.94	706.3	706.3	707.1	0.8
F	27,150	300	2,131	5.44	707.0	707.0	708.0	1.0
G	28,950	211	1,969	6.04	712.8	712.8	713.6	0.8
H	29,330	225	1,888	6.30	713.7	713.7	714.5	0.8
I	30.590	191	2,094	5.68	718.2	718.2	718.7	0.5
J	31,770	394	2,897	4.21	721.0	721.0	721.7	0.7
K	32,700	256	1,872	5.45	724.9	724.9	725.8	0.9
L	33,730	250	1,909	5.34	728.1	728.1	728.8	0.7
M	34,300	237	1,716	5.77	729.5	729.5	730.5	1.0
N	35,100	219	1,466	6.75	732.6	732.6	733.4	0.8
O	35,930	180	1,139	8.69	737.4	737.4	737.7	0.3
P	37,630	182	1,442	6.87	746.5	746.5	746.9	0.4
Q[2]	38,360	178	1,368	7.31	749.1	749.1	750.0	0.9
R[2]	39,150	566	5,033	1.99	757.1	757.1	757.4	0.3
S	40,620	125	595	4.37	765.1	765.1	765.6	0.5

[1]Feet above mouth
[2]Common flood plain with South Fork of Deer Creek

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF CROWLEY, TX
(TARRANT CO.)

FLOODWAY DATA

DEER CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Northwest Branch of Deer Creek								
A	2,260	117	492	7.31	698.5	698.5	698.7	0.2
B	3,720	142	781	4.61	707.0	707.0	707.7	0.7
C	5,600	165	678	4.79	721.2	721.2	721.5	0.3
D	7,000	150	475	6.84	731.4	731.4	731.4	0.0
E	8,060	226	743	4.37	739.4	739.4	740.2	0.8
North Branch of Deer Creek								
A	980	226	1,466	6.41	706.7	706.7	707.3	0.6
B	2,600	309	2,433	3.86	713.2	713.2	714.0	0.8
C	3,110	506	4,782	1.97	721.1	721.1	722.0	0.9
D	4,010	371	3,239	2.90	721.5	721.5	722.5	1.0
E	4,830	156	1,143	8.20	722.0	722.0	723.0	1.0
F	7,600	180	1,718	5.70	734.9	734.9	735.7	0.8
G	9,950	307	2,077	4.77	746.4	746.4	747.1	0.7
H[2]	11,140	478	2,272	4.36	749.7	749.7	750.7	1.0
I[3]	14,020	139	821	4.69	765.9	765.9	766.8	0.9

[1]Feet above mouth.
[2]Common flood plain with South Fork of North Branch of Deer Creek.
[3]Outside corporate limits.

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF CROWLEY, TX
(TARRANT CO.)

FLOODWAY DATA

NORTHWEST BRANCH OF DEER CREEK-NORTH BRANCH OF DEER CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
South Fork of North Branch of Deer Creek								
H[4]	1,100	*	*	*	749.7	749.7	*	*
A	2,070	121	897	6.36	753.6	753.9	754.8	0.9
B	3,080	107	743	7.67	759.9	759.9	760.7	0.8
C	3,800	100	719	7.93	765.4	765.4	766.2	0.8
D[3]	4,710	129	1,146	4.97	769.4	769.4	770.2	0.8
South Fork of Deer Creek								
Q[2]	100	*	*	*	749.1	749.1	*	*
R[2]	900	*	*	*	757.1	757.1	*	*
A	1,550	189	1,593	4.90	757.5	757.5	758.5	1.0
B	2,630	278	2,575	5.27	762.9	762.9	763.2	0.3
C	3,550	284	1,230	5.77	766.4	766.4	767.1	0.7
D[3]	6,450	274	1,193	5.95	782.7	782.7	783.4	0.7
E[3]	8,250	322	1,705	4.16	790.8	790.8	791.8	1.0
F[3]	9,200	248	1,229	5.78	794.7	794.7	795.6	0.9

[1]Feet above mouth.
*Not determined.
[2]Common flood plain with Deer Creek.
[3]Outside corporate limits.
[4]Common flood plain with North Branch of Deer Creek.

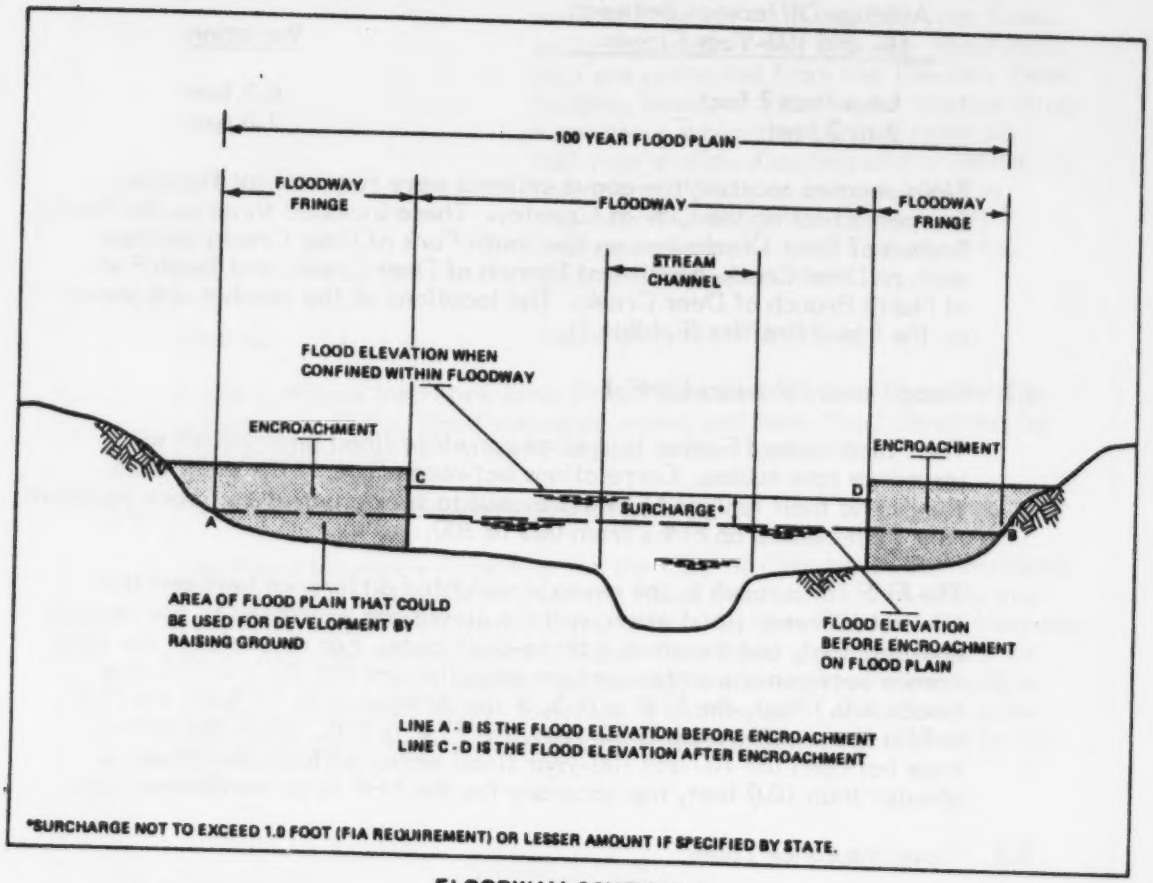
TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF CROWLEY, TX
(TARRANT CO.)

FLOODWAY DATA

SOUTH FORK OF NORTH BRANCH OF DEER CREEK-
SOUTH FORK OF DEER CREEK


100 YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
A
B
SURCHARGE*
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE A - B IS THE FLOOD ELEVATION BEFORE ENCROACHMENT
LINE C - D IS THE FLOOD ELEVATION AFTER ENCROACHMENT
*SURCHARGE NOT TO EXCEED 1.0 FOOT (FIA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE.

FLOODWAY SCHEMATIC

Figure 2

5.0 INSURANCE APPLICATION

In order to establish actuarial insurance rates, the FIA has developed a process to transform the data from the engineering study into flood insurance criteria. This process includes the determination of reaches, Flood Hazard Factors (FHFs), and flood insurance zone designations for each significant flooding source affecting the City of Crowley.

5.1 Reach Determinations

Reaches are defined as lengths of watercourses having relatively the same flood hazard, based on the average weighted difference in water-surface elevations between the 10- and 100-year floods. This difference does not have a variation greater than that indicated in the following table for more than 20 percent of the reach.

Average Difference Between 10- and 100-Year Floods	Variation
Less than 2 feet	0.5 foot
2 to 7 feet	1.0 foot

Eight reaches meeting the above criteria were required for flooding sources affecting the City of Crowley. These included three on the North Branch of Deer Creek; two on the South Fork of Deer Creek; and one each on Deer Creek, Northwest Branch of Deer Creek, and South Fork of North Branch of Deer Creek. The locations of the reaches are shown on the Flood Profiles (Exhibit 1).

5.2 Flood Hazard Factors (FHFs)

The Flood Hazard Factor is used to correlate flood information with insurance rate tables. Correlations between property damages from floods and their assigned FHFs are used to set actuarial insurance premium rate tables based on FHFs from 005 to 200.

The FHF for a reach is the average weighted difference between the 10- and 100-year flood water-surface elevations expressed to the nearest one-half foot, and shown as a three-digit code. For example, if the difference between the water-surface elevations of the 10- and 100-year floods is 0.7 foot, the FHF is 005; if the difference is 1.4 feet, the FHF is 015; if the difference is 5.0 feet, the FHF is 050. When the difference between the 10- and 100-year flood water-surface elevations is greater than 10.0 feet, the accuracy for the FHF is to the nearest foot.

5.3 Flood Insurance Zones

After the determination of reaches and their respective FHFs, the entire incorporaed area of the City of Crowley was divided into zones, each having a specific flood potential or hazard. Each zone was assigned one of the following flood insurance zone designations.

Zones A1, A2, A3, A4, A6, and A9:	Special Flood Hazard Areas inundated by the 100-year flood, determined by detailed methods; base flood elevations shown, and zones subdivided according to FHFs.

Zone B:	Areas between the Special Flood Hazard Area and the limits of the 500-year flood, including areas of the 500-year flood plain that are protected from the 100-year flood by dike, levee, or other water control structure; areas subject to certain types of 100-year shallow flooding where depths are less than 1.0 foot; or areas subject to 100-year flooding from sources with drainage areas less than 1 square mile. Zone B is not subdivided.
Zone C:	Areas of minimal flooding.

Table 3, "Flood Insurance Zone Data," summarizes the flood elevation differences, FHFs, flood insurance zones, and base flood elevation for each flooding source studied in detail in the community.

5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map for the City of Crowley is, for insurance purposes, the principal result of the Flood Insurance Study. This map (published separately) contains the official delineation of flood insurance zones and base flood elevation lines. Base flood elevation lines show the locations of the expected whole-foot water-surface elevations of the base (100-year) flood. This map is developed in accordance with the latest flood insurance map preparation guidelines published by the FIA.

6.0 OTHER STUDIES

A Flood Plain Information (FPI) Report entitled Deer Creek and Tributaries (Reference 1) was prepared by the COE and published in October 1977. The profiles developed for this report, except for the lower part of the North Branch of Deer Creek, differ from those in the present study by as much as 2 feet in some reaches due primarily to the differences in watershed and stream conditions and the fact that additional cross sections were obtained for this study. During the course of this study, a survey datum error was found in the FPI report that affected the lower reach of the North Branch of Deer Creek. Correcting this error reduced the base flood elevations in that area about 6 feet.

The results of this study were compared to the Preliminary Flood Insurance Study for the adjacent City of Fort Worth. The food delineations for Deer Creek, the only point of comparision, are in agreement.

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION[3]
		10% (10 YR.)	2% (50 YR.)	0.2% (500 YR.)			
Deer Creek							
Reach 1	0005	-2.0	-0.6	1.3	020	A4	Varies
Northwest Branch of Deer Creek							
Reach 1	0005	-0.6	-0.2	0.3	005	A1	Varies
North Branch of Deer Creek							
Reach 1	0005	-1.6	-0.4	0.8	015	A3	Varies
Reach 2	0005	-4.3	-1.4	3.3	045	A9	Varies
Reach 3	0005	-1.2	-0.3	0.8	010	A2	Varies
South Fork of North Branch of Deer Creek							
Reach 1	0005	-1.3	-0.3	0.8	015	A3	Varies

[1]FLOOD INSURANCE RATE MAP PANEL
[2]WEIGHTED AVERAGE
[3]ROUNDED TO NEAREST FOOT-SEE MAP

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF CROWLEY, TX
(TARRANT CO.)

FLOOD INSURANCE ZONE DATA

DEER CREEK, NORTHWEST BRANCH OF DEER CREEK -NORTH BRANCH OF DEER CREEK- SOUTH FORK OF NORTH BRANCH OF DEER CREEK

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION[3]
		10% (10 YR.)	2% (50 YR.)	0.2% (500 YR.)			
South Fork of Deer Creek							
Reach 1	0005	-2.9	-0.9	2.9	030	A6	Varies
Reach 2	0005	-0.7	-0.2	0.6	005	A1	Varies

[1]FLOOD INSURANCE RATE MAP PANEL
[2]WEIGHTED AVERAGE
[3]ROUNDED TO NEAREST FOOT-SEE MAP

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF CROWLEY, TX
(TARRANT CO.)

FLOOD INSURANCE ZONE DATA

SOUTH FORK OF DEER CREEK

7.0 LOCATION OF DATA

Survey, hydrologic, hydraulic, and other pertinent data used in this study can be obtained by contacting the office of the Federal Emergency Management Agency, Insurance and Mitigation Division, Federal Center, Denton, Texas 76201.

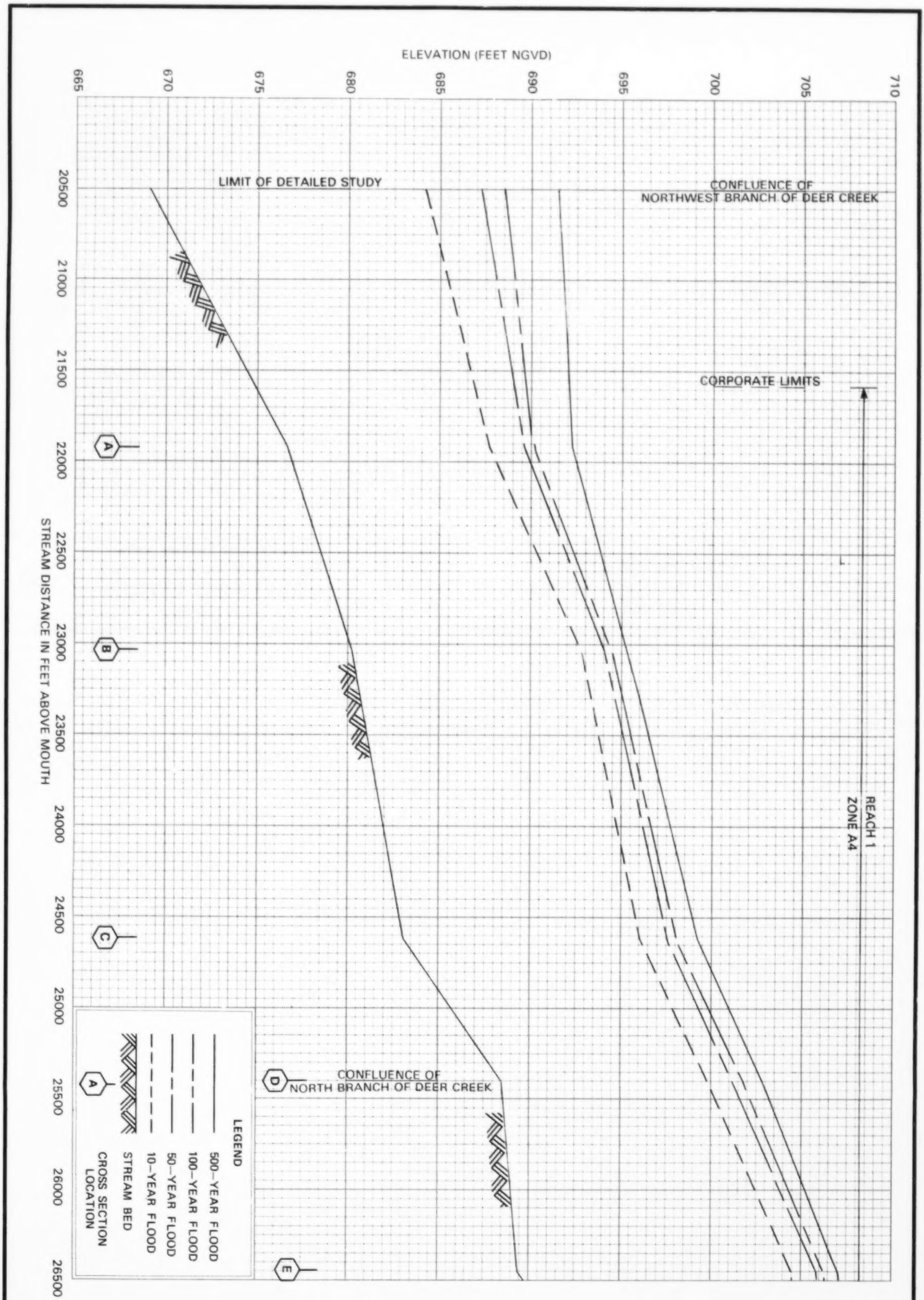
8.0 BIBLIOGRAPHY AND REFERENCES

1. U.S. Army Corps of Engineers, Flood Plain Information Report, Deer Creek and Tributaries, Crowley, Texas, October 1977.

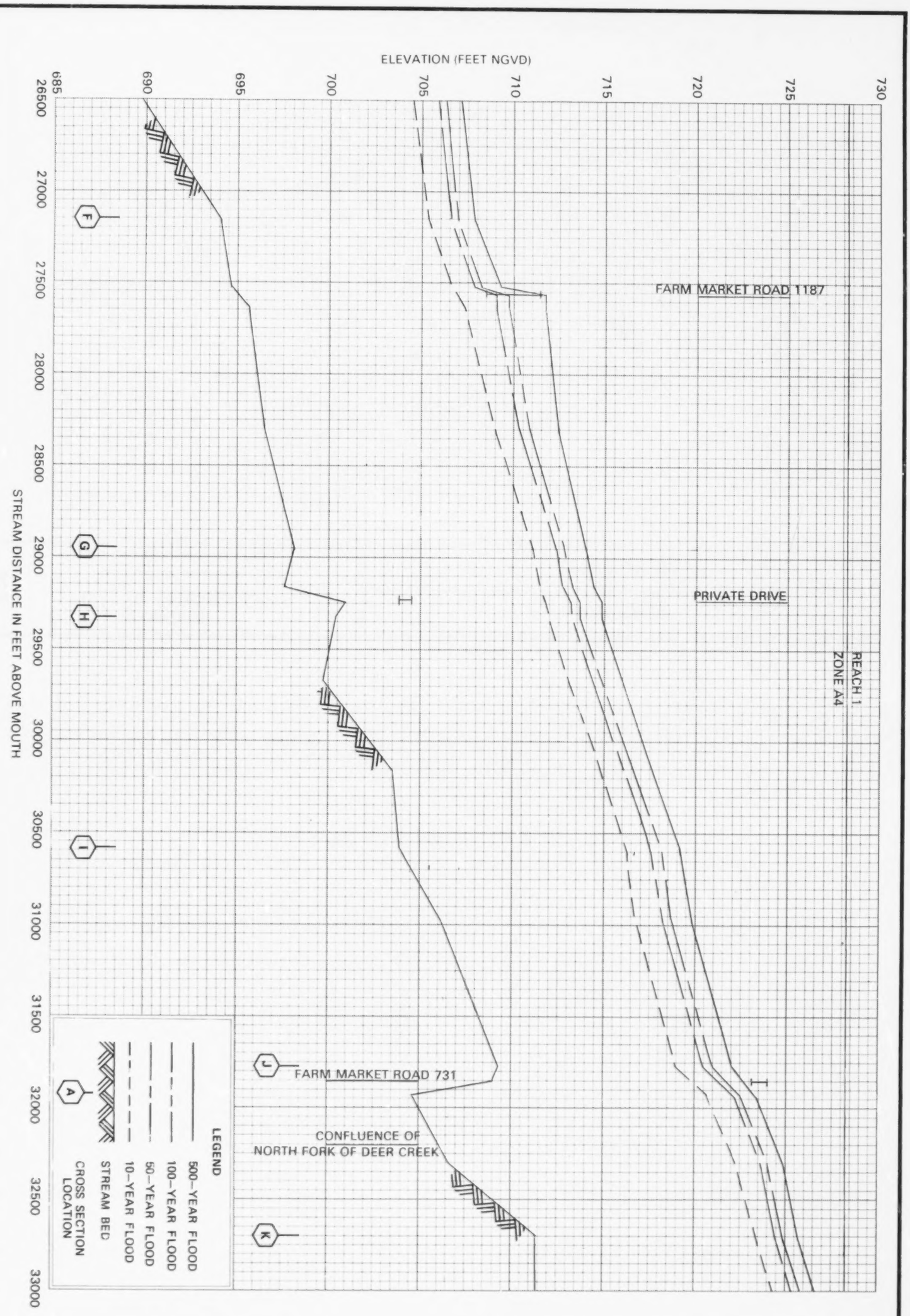
2. National Weather Service, Technical Paper Number 40, Rainfall Frequency Atlas of the United States, May 1961.

3. U.S. Army Corps of Engineers, HEC-2, Water Surface Profiles, Hydrologic Engineering Center, Davis, California, February 1972.

4. US Geologcial Survey 7½-Minute Quadrangle Map: Haltom City, Texas dated 1955 and photorevised in 1968 and 1972.



01P	FEDERAL EMERGENCY MANAGEMENT AGENCY Federal Insurance Administration **CITY OF CROWLEY, TX** (TARRANT CO.)	**FLOOD PROFILES** **DEER CREEK**



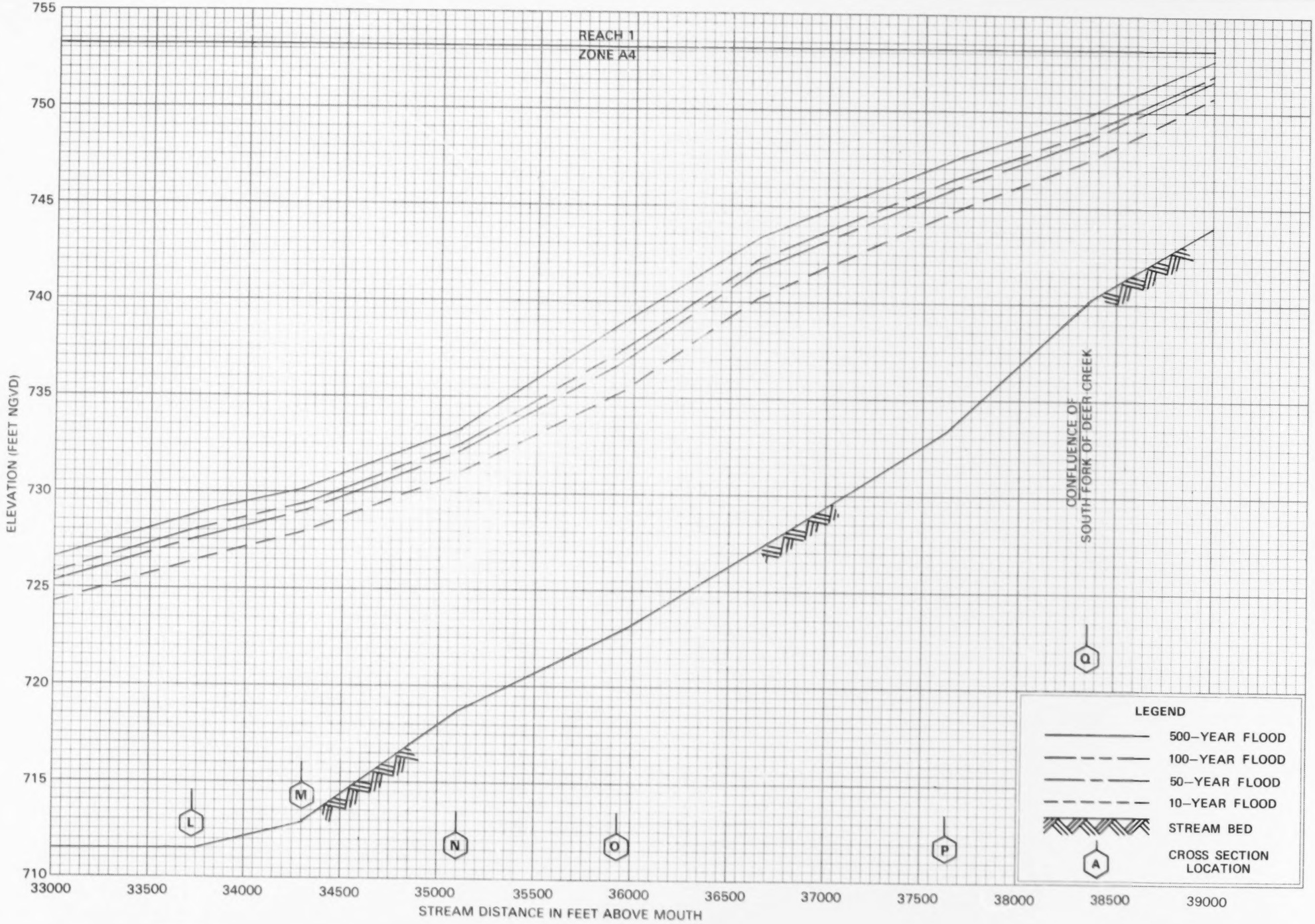
02P

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF CROWLEY, TX
(TARRANT CO.)

FLOOD PROFILES

DEER CREEK



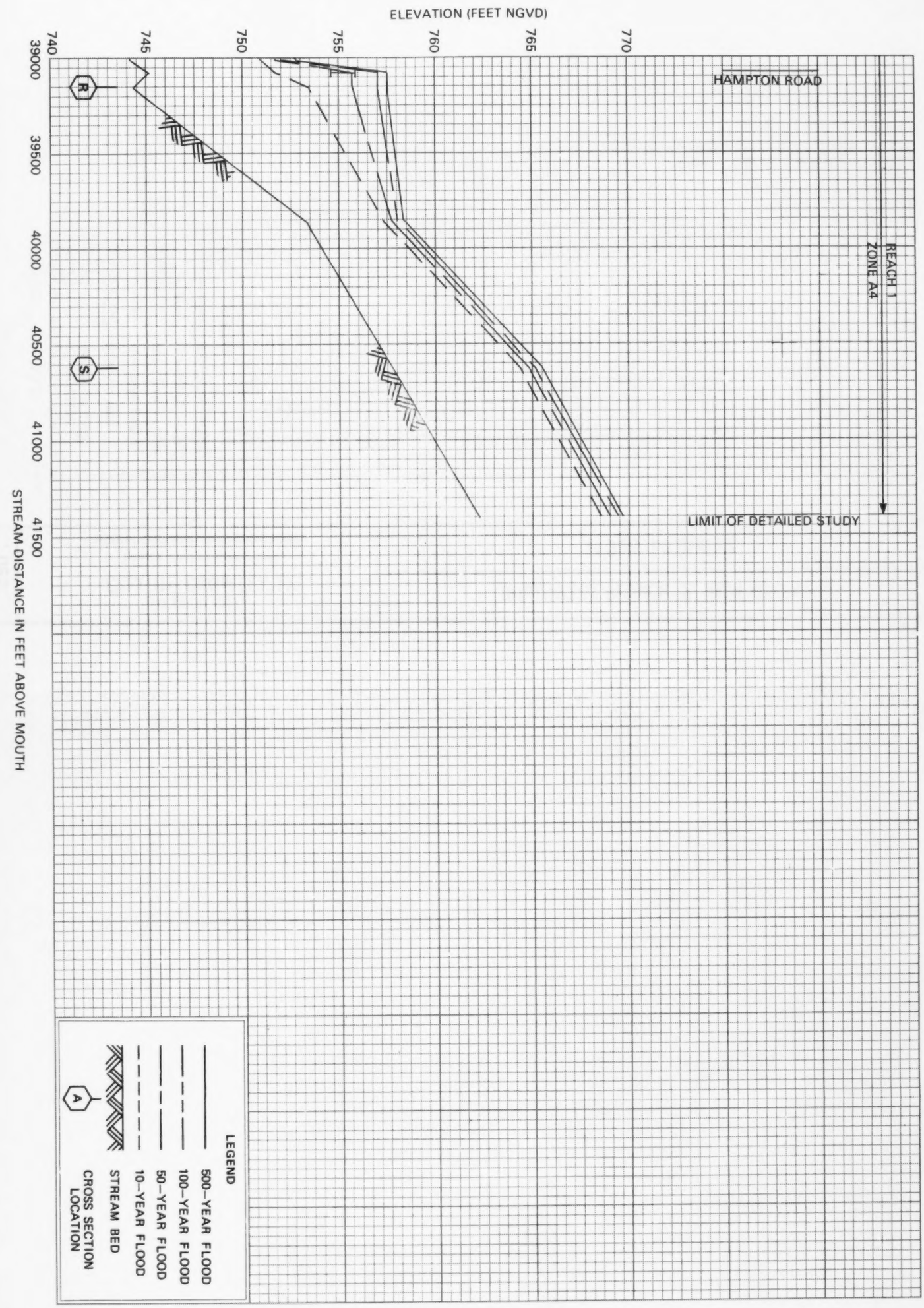
FLOOD PROFILES

DEER CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF CROWLEY, TX
(TARRANT CO.)

03P



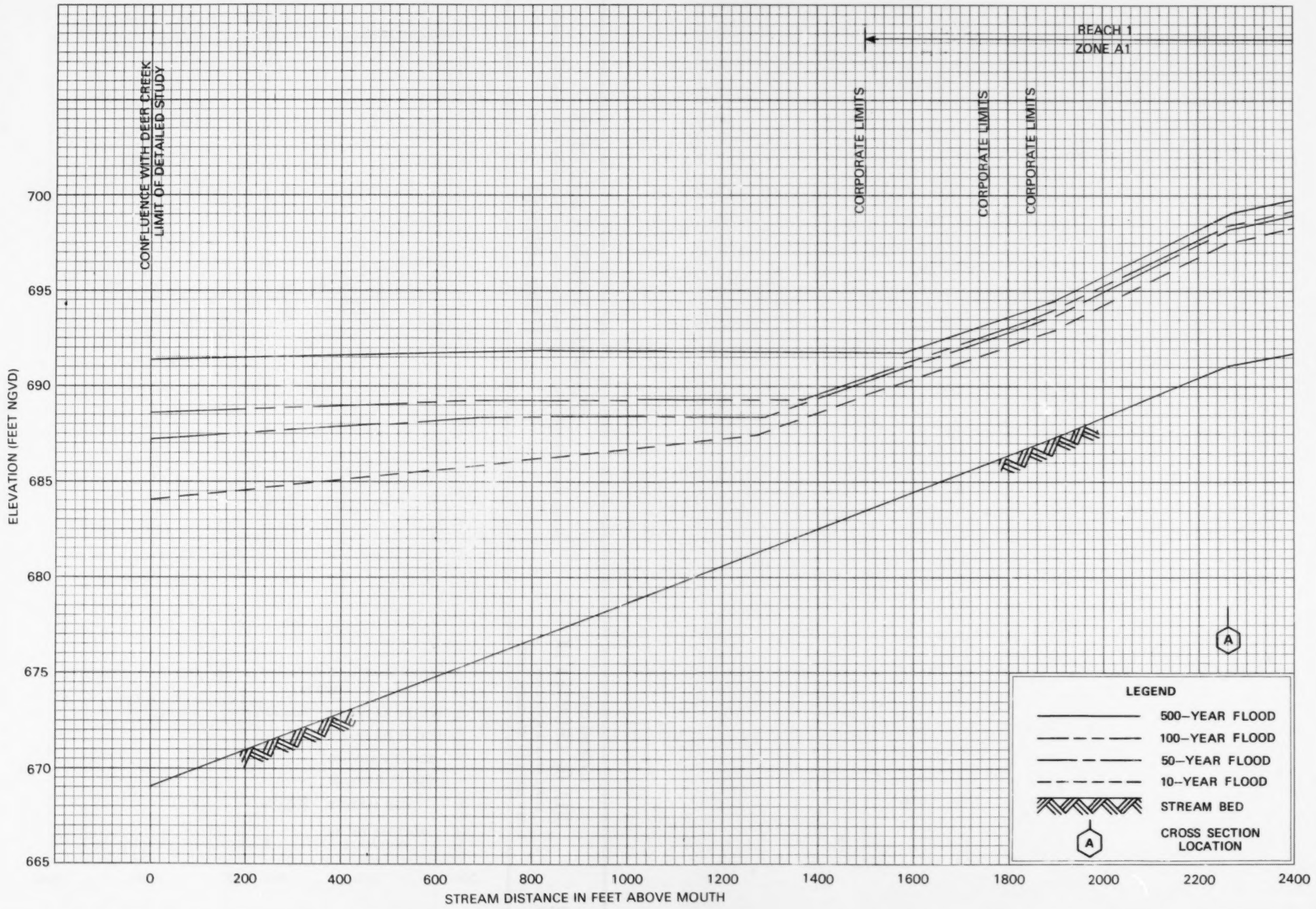
04P

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF CROWLEY, TX
(TARRANT CO.)

FLOOD PROFILES

DEER CREEK



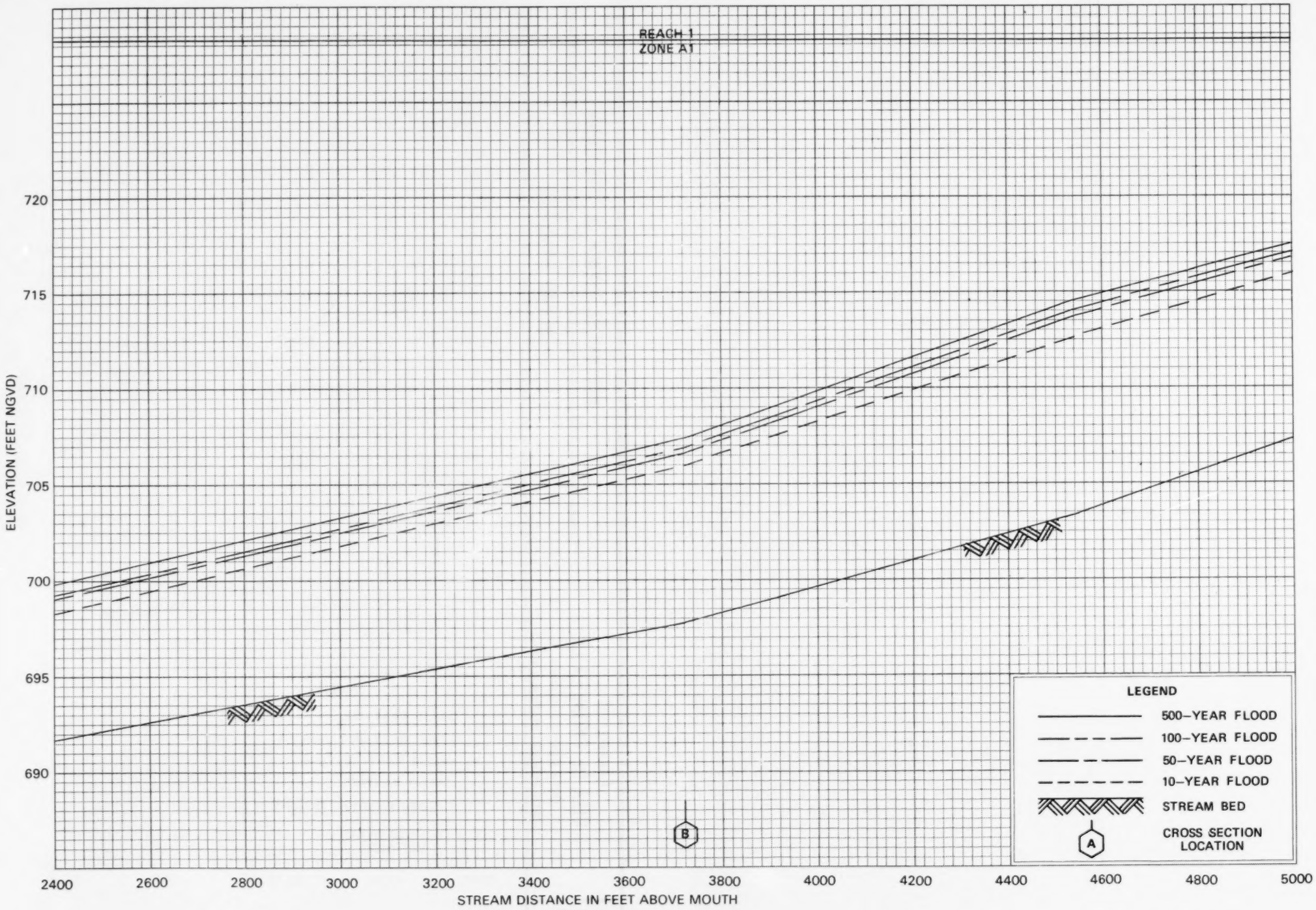
FLOOD PROFILES

NORTHWEST BRANCH OF DEER CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF CROWLEY, TX
(TARRANT CO.)

05P



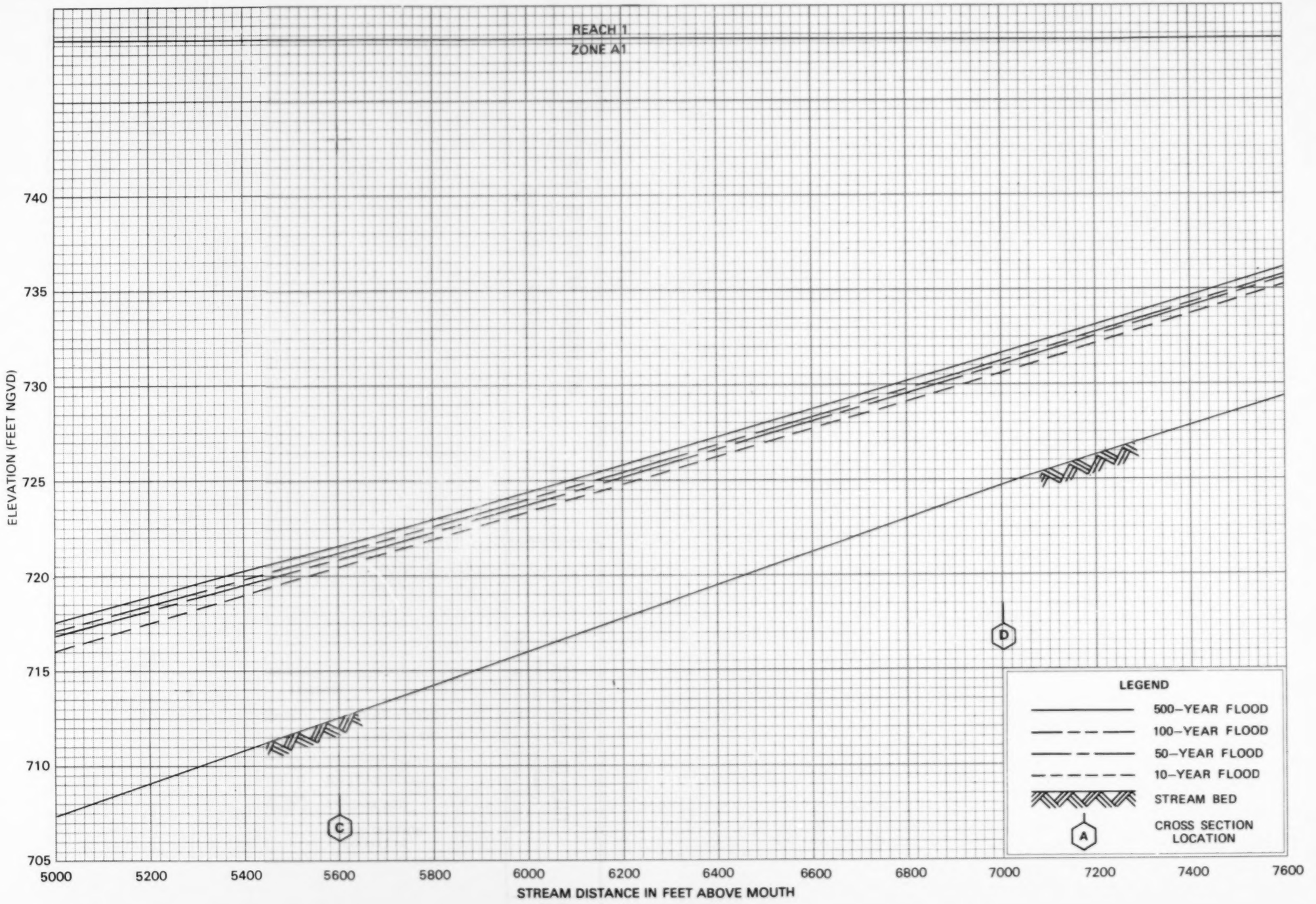
FLOOD PROFILES

NORTHWEST BRANCH OF DEER CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF CROWLEY, TX
(TARRANT CO.)

06P



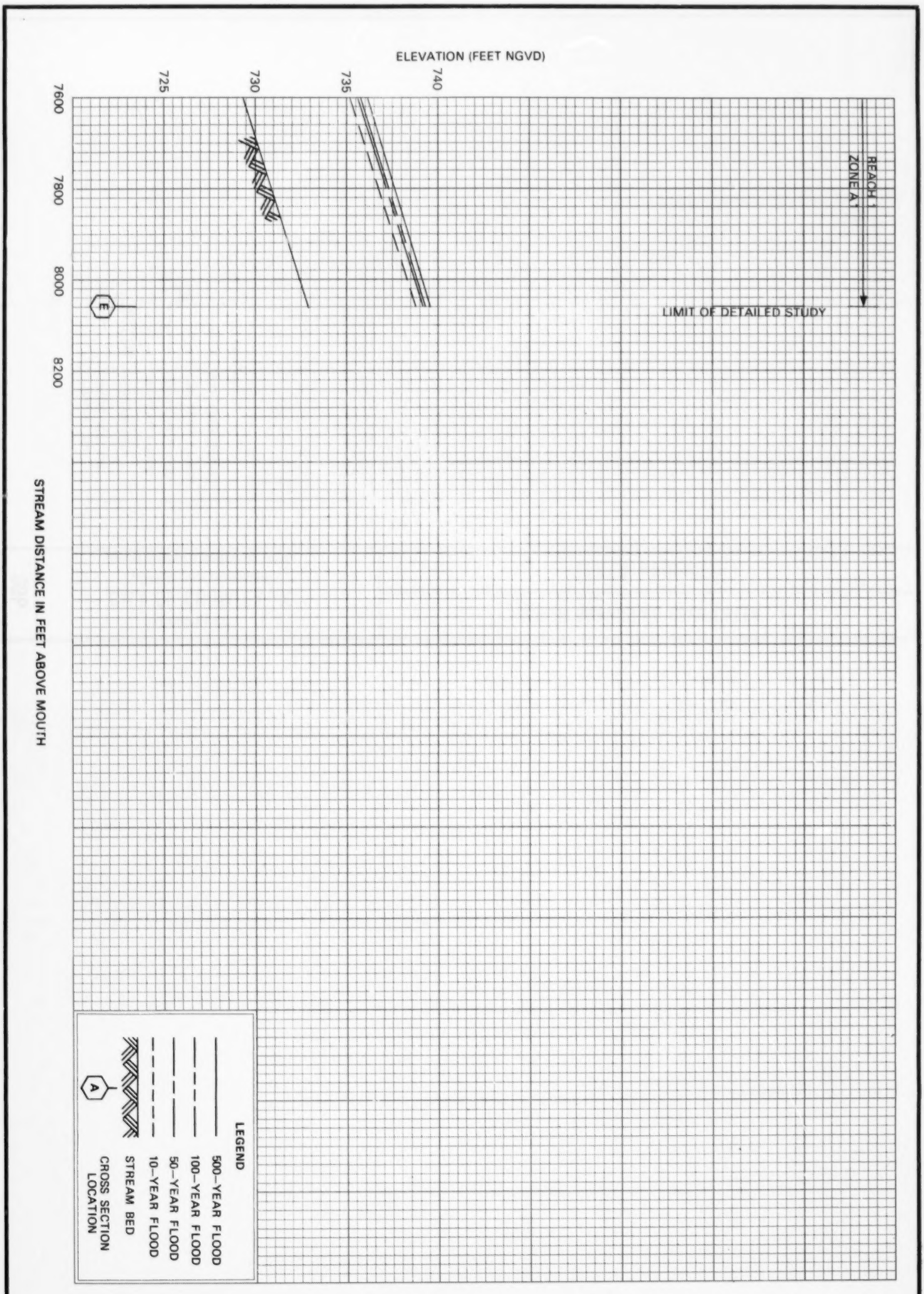
FLOOD PROFILES

NORTHWEST BRANCH OF DEER CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF CROWLEY, TX
(TARRANT CO.)

07P



08P

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF CROWLEY, TX
(TARRANT CO.)

FLOOD PROFILES

NORTHWEST BRANCH OF DEER CREEK

FLOOD PROFILES

NORTH BRANCH OF DEER CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF CROWLEY, TX
(TARRANT CO.)

09P

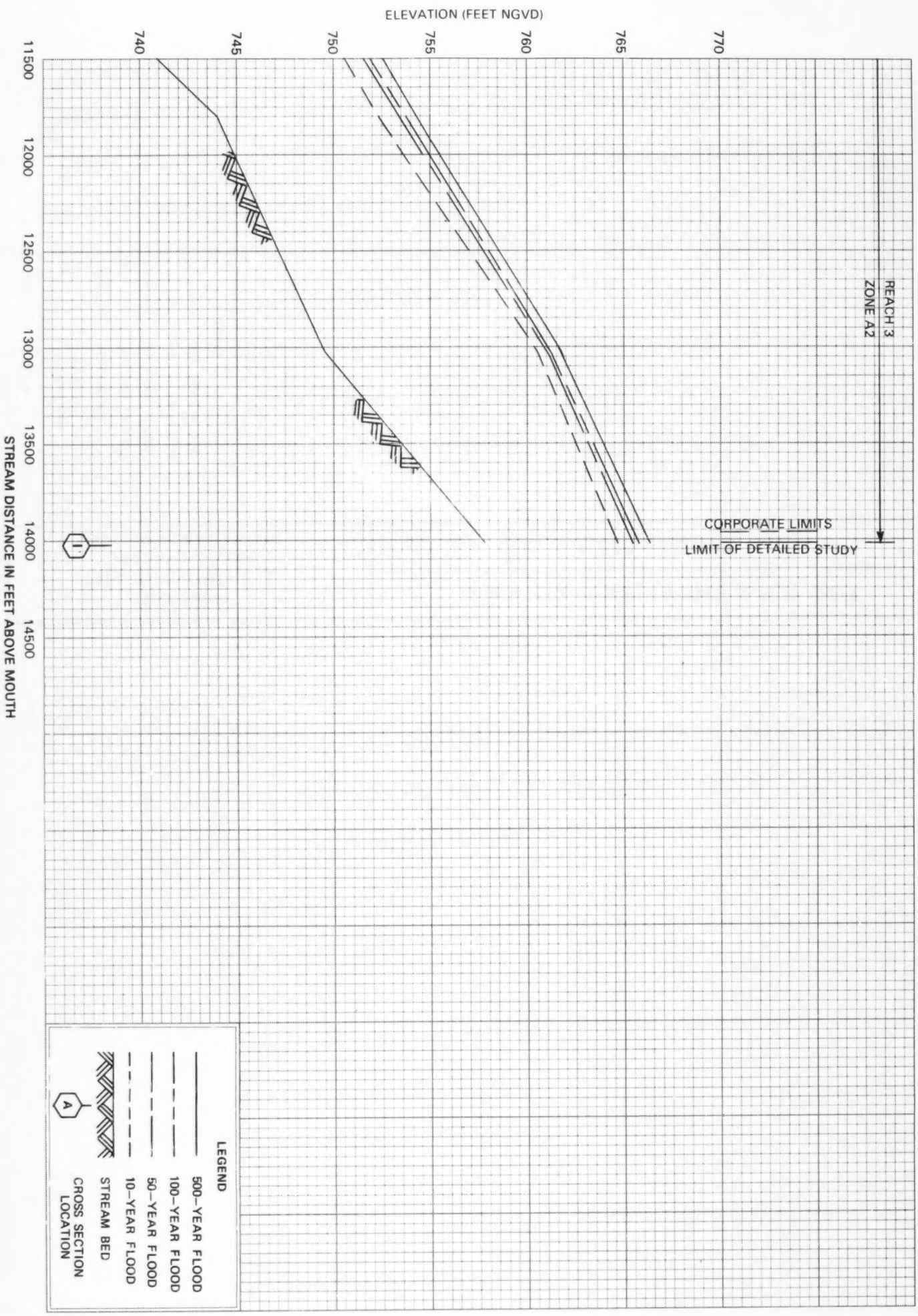
FLOOD PROFILES

NORTH BRANCH OF DEER CREEK

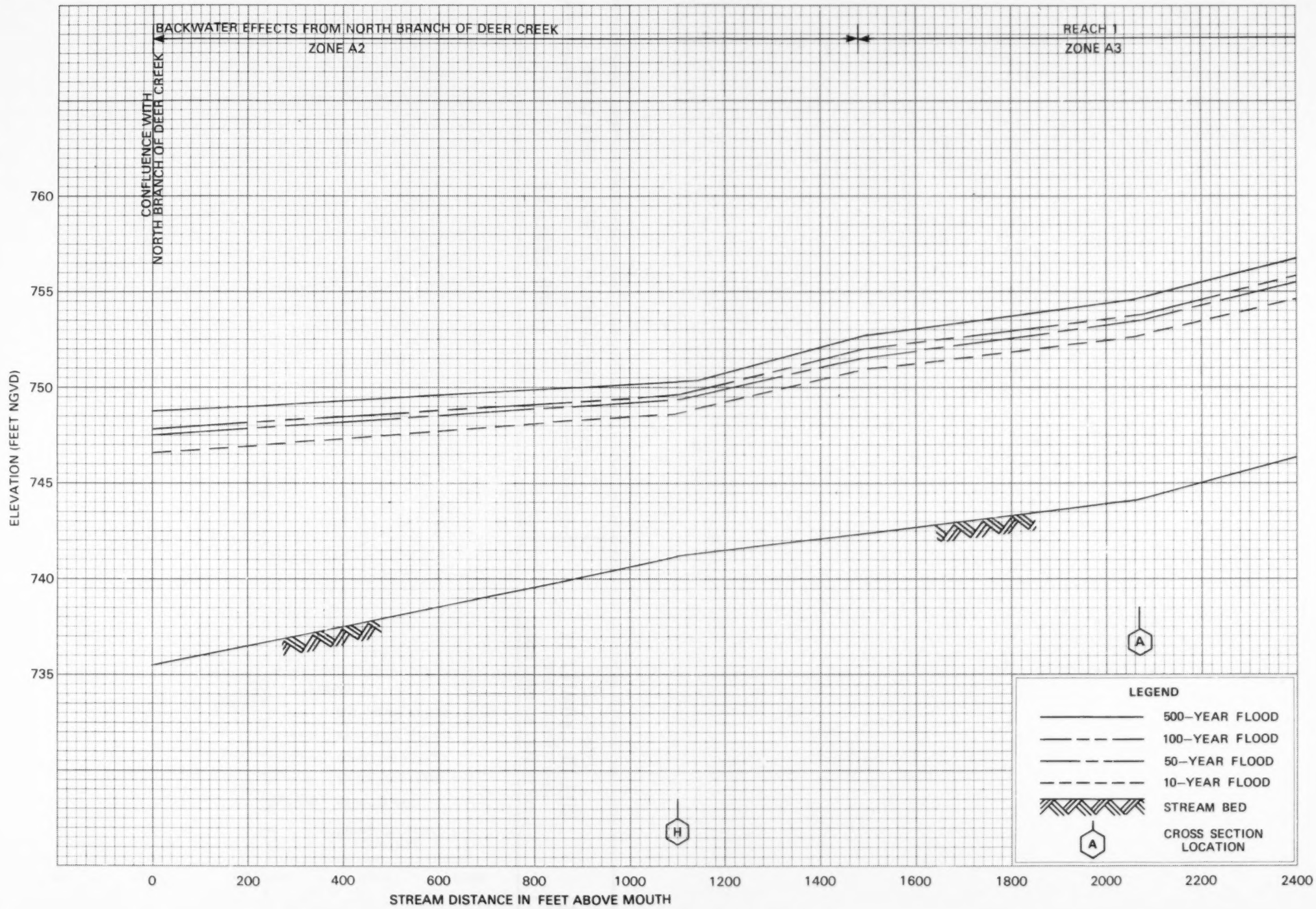
FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF CROWLEY, TX
(TARRANT CO.)

10P



11P	FEDERAL EMERGENCY MANAGEMENT AGENCY Federal Insurance Administration **CITY OF CROWLEY, TX** (TARRANT CO.)	**FLOOD PROFILES** **NORTH BRANCH OF DEER CREEK**



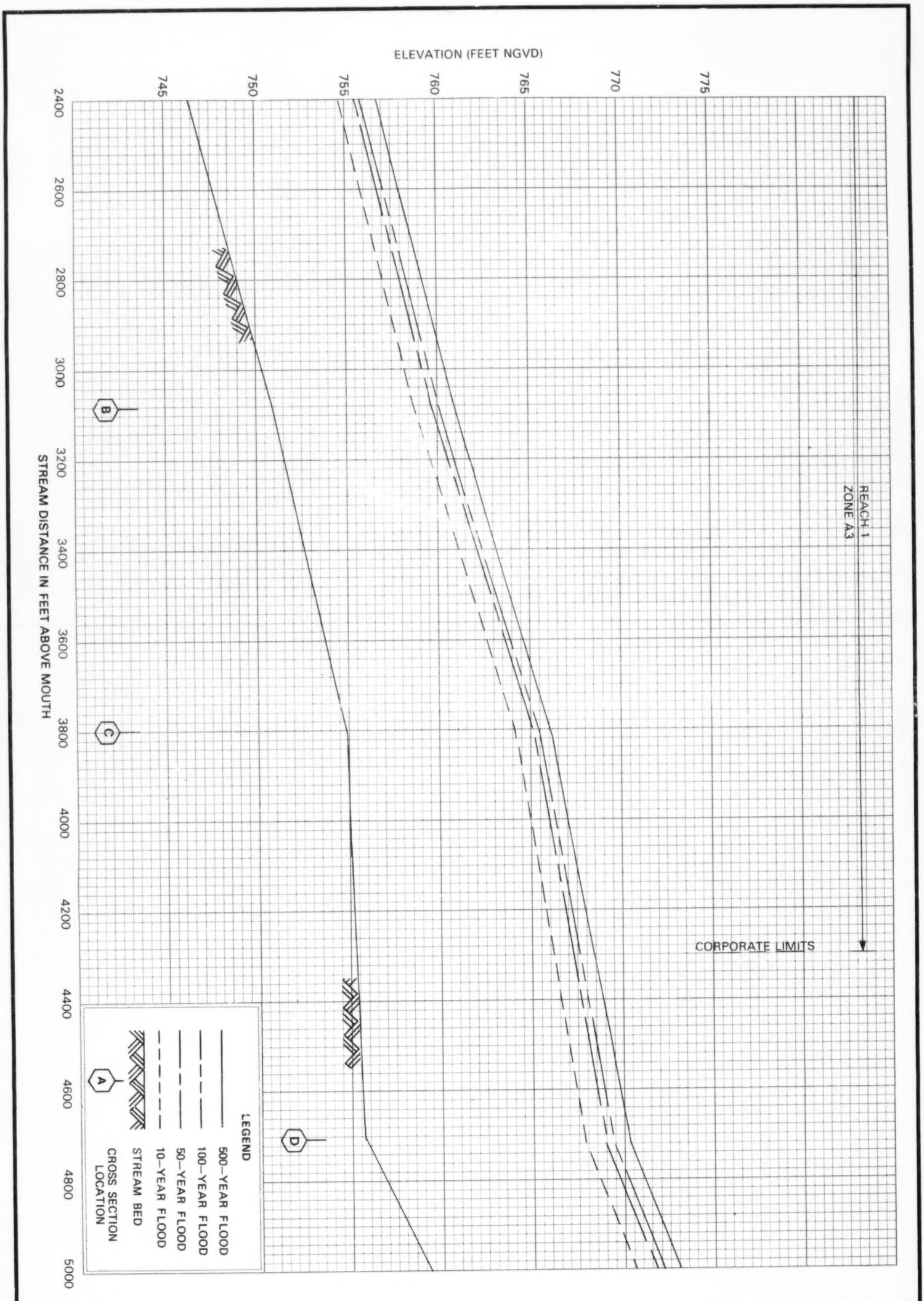
FLOOD PROFILES

SOUTH FORK OF NORTH BRANCH OF DEER CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF CROWLEY, TX
(TARRANT CO.)

12P



13P

FEDERAL EMERGENCY MANAGEMENT AGENCY

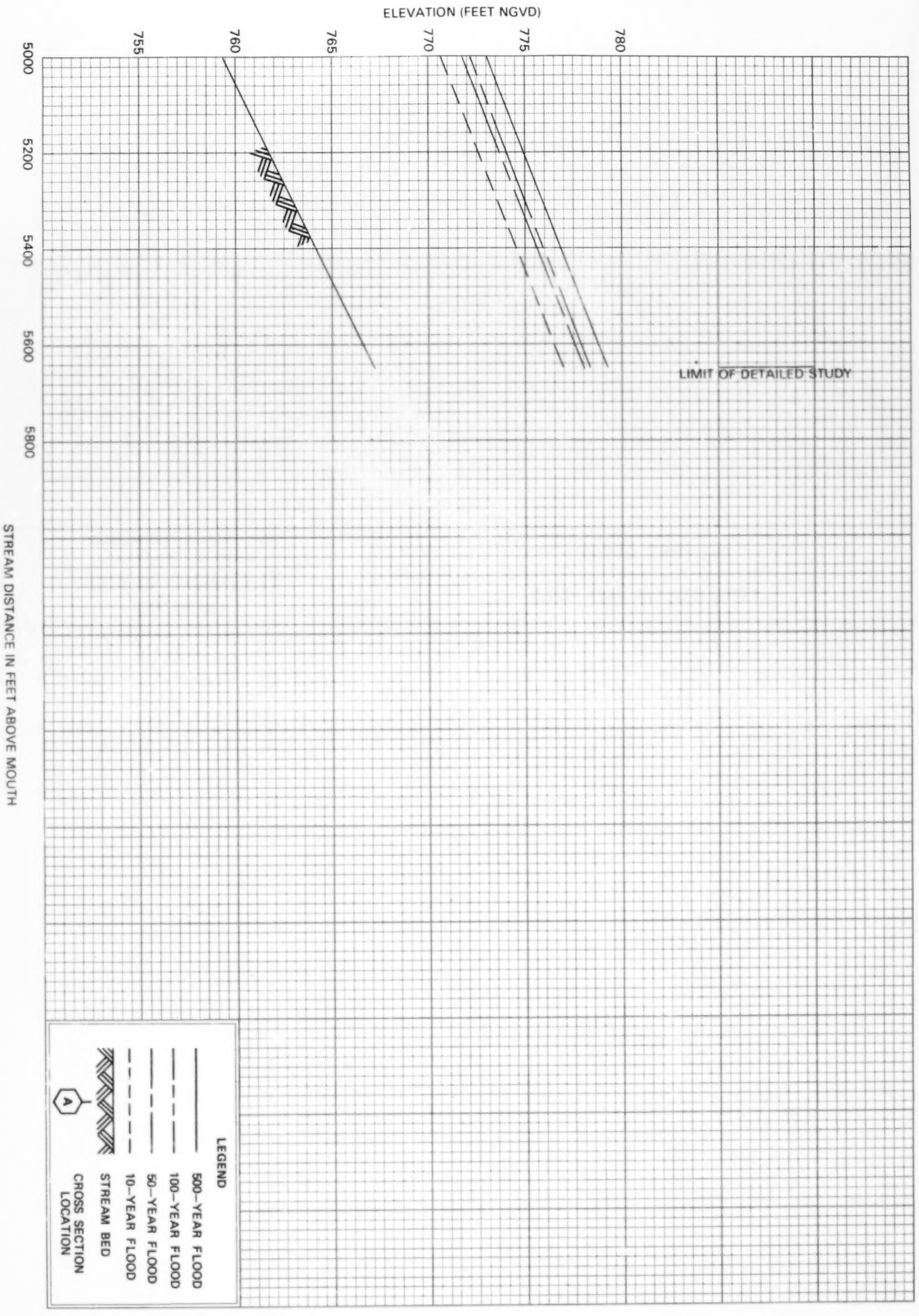
Federal Insurance Administration

CITY OF CROWLEY, TX

(TARRANT CO.)

FLOOD PROFILES

SOUTH FORK OF NORTH BRANCH OF DEER CREEK

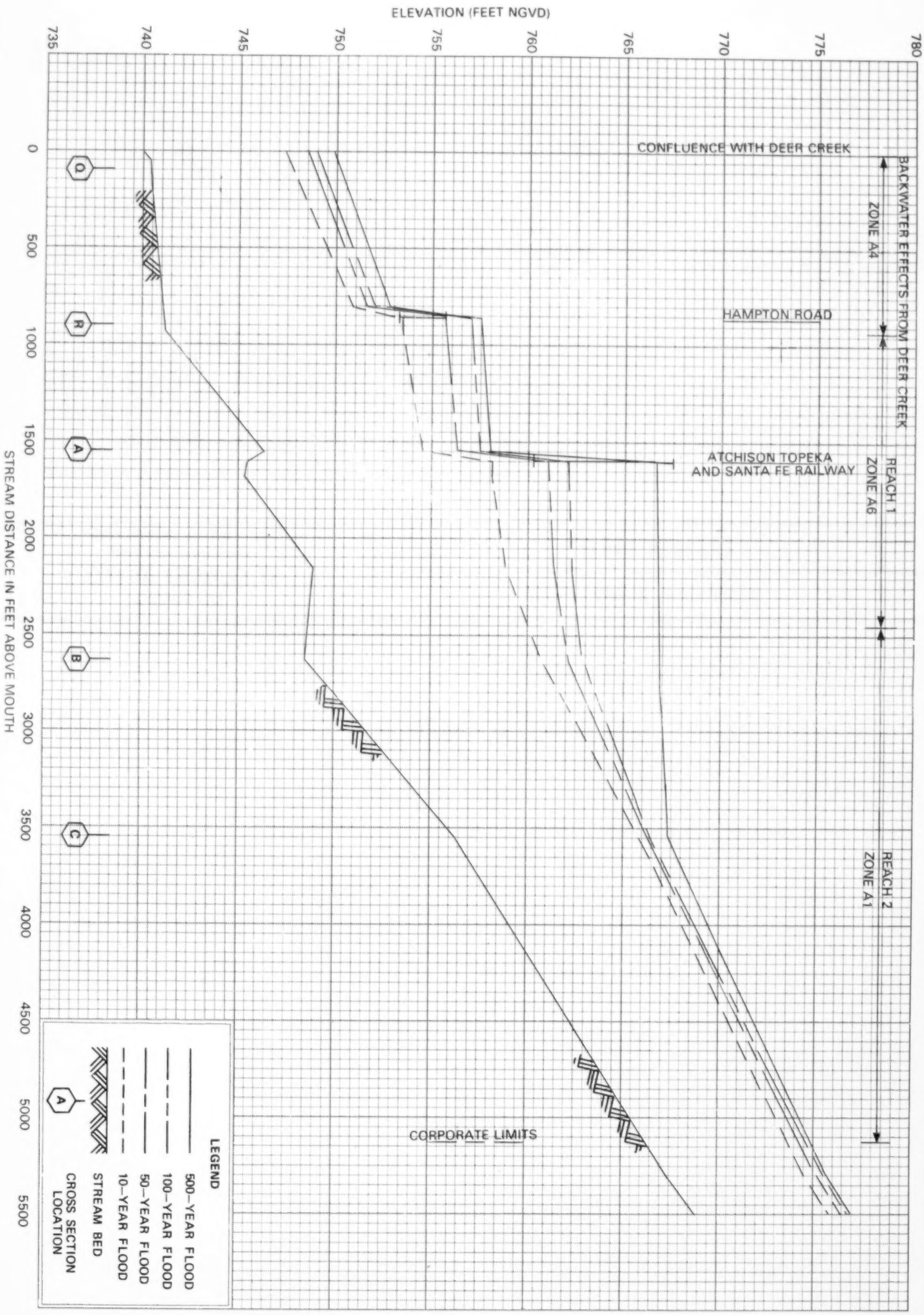


14P

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration
CITY OF CROWLEY, TX
(TARRANT CO.)

FLOOD PROFILES

SOUTH FORK OF NORTH BRANCH OF DEER CREEK

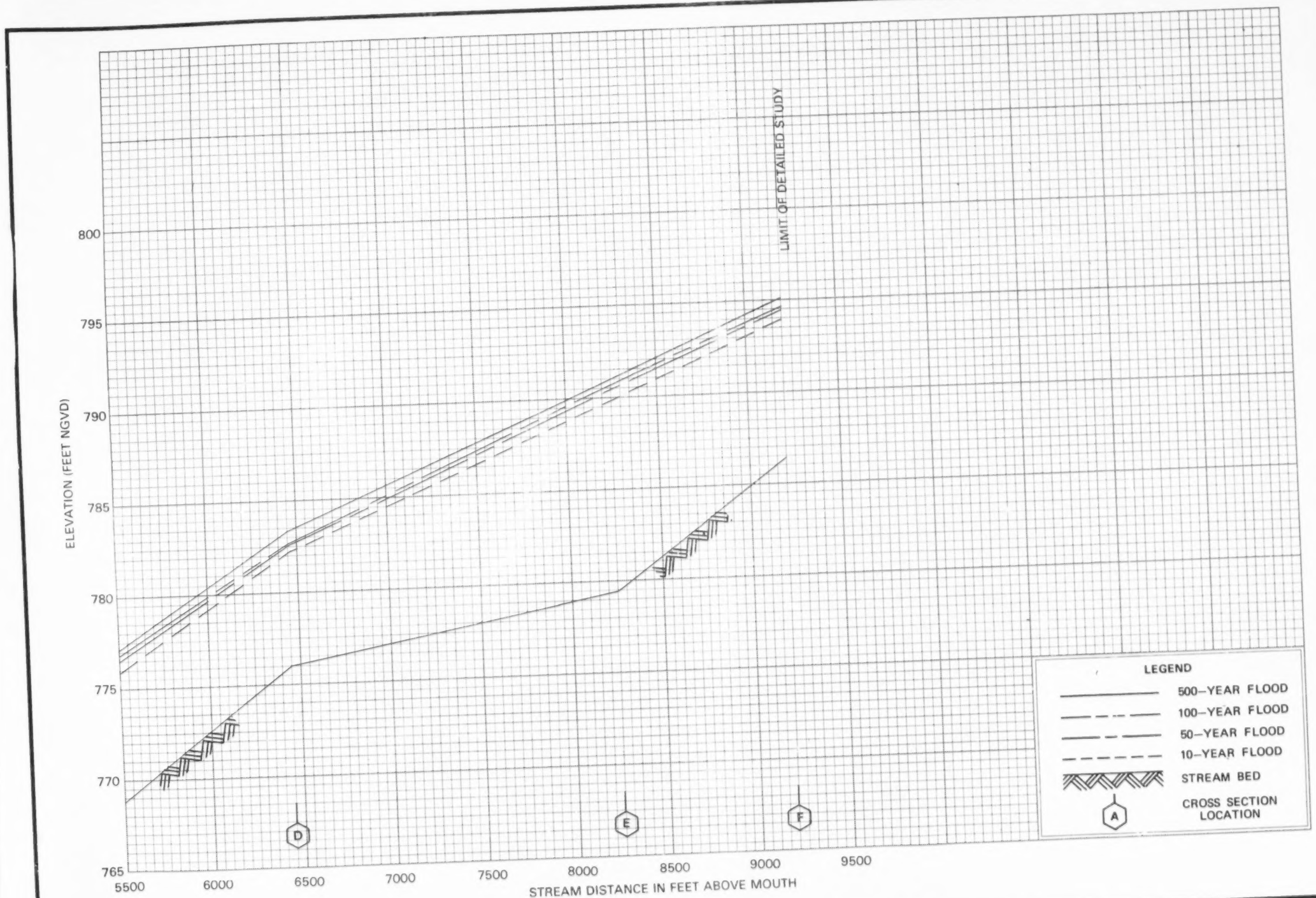


15P

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration
CITY OF CROWLEY, TX
(TARRANT CO.)

FLOOD PROFILES

SOUTH FORK OF DEER CREEK



FLOOD PROFILES

SOUTH FORK OF DEER CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

CITY OF CROWLEY, TX
(TARRANT CO.)

16P